

NASA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

RELIABILITY AND QUALITY ASSURANCE
GUIDELINE FOR
GOVERNMENT-FURNISHED EQUIPMENT CONTROL

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MANNED SPACECRAFT CENTER
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PREFACE

This document is a guideline for control of NASA Manned Spacecraft Center produced or procured GFE (government-furnished equipment) by recipients of such equipment. Such controls have been implemented at MSC through QOP's (quality operating procedures) and QAI's (quality assurance instructions). Similar controls at contractors' facilities may be required at the direction of the appropriate program office or technical monitor.

Comments and questions regarding this document should be directed to the Manned Spacecraft Center, Reliability and Quality Assurance Office, NA.

A handwritten signature in dark ink, appearing to read 'M. L. Raines', with a long horizontal flourish extending to the right.

M. L. Raines, Manager
Reliability and Quality Assurance

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1.0 INTRODUCTION

1.1 PURPOSE. This document has been developed to serve as a guideline to recipients of GFE (Government-furnished equipment) in the preparation of their internal GFE control program to provide for the welfare of the NASA MSC property furnished as GFE.

1.2 SCOPE. This document is applicable to GFE which has been procured or produced by NASA MSC and furnished to a contractor or another NASA center. It is not applicable to GFE procured or furnished by other NASA centers or other Government agencies.

These guidelines have been utilized to provide positive control of all MSC-supplied GFE, including flight-related equipment and mission-essential GFE for the Apollo, Skylab, and other manned space flight programs to insure the following:

- a. The successful operation of the GFE is not compromised by improper handling, testing, storage, shipping, or contamination.
- b. All GFE nonconformances are properly recorded and acted upon.
- c. The data package factually represents a chronological history of the GFE article.

2.0 GENERAL

The strict control of GFE by all users is essential to maintaining the reliability and quality designed and built into the product. Reliability and quality systems have been implemented for the design, procurement, fabrication, assembly, test, and shipment of equipment manufactured to exacting standards and qualified for manned space flight usage.

3.0 CONTROL GUIDELINES

GFE supplied by the NASA Manned Spacecraft Center may be new, used, or overhauled equipment. Regardless of the category, the equipment is considered by the Manned Spacecraft Center as serviceable and ready for its intended use. Equipment may be identified and classified as follows:

- a. Class I - Acceptable for use in flight
- b. Class II - Unacceptable for flight, but may be used for ground testing or training in a hazardous environment. The name plate or label adjacent to the name plate should be conspicuously marked "CLASS II, CONTROLLED EQUIPMENT," with flight compatible material.
- c. Class III - Unacceptable for flight or use in a hazardous environment, but may be used for nonhazardous training or display purposes.

This equipment should be conspicuously identified by red stripes alternating with a contrasting base color. An alternative to the paint method of identification is a red striped nameplate or label marked "CLASS III, NOT FOR FLIGHT," applied to the equipment. If physical characteristics of the article prevent adequate marking, a red tag conspicuously marked "NOT FOR FLIGHT USE" should be attached to the equipment. The identification should be visible when the equipment is installed.

Adequate controls should be established and maintained by the recipient of GFE to ensure the preservation of integrity of the item and validity of tests such as qualification and acceptance. Defective GFE should be segregated and protected in a manner that will assist in subsequent determination of discrepancy cause. The recipient quality assurance organization should assure adherence to material handling procedures and defective GFE control and reporting requirements.

3.1 RECEIVING INSPECTION. Upon receipt, GFE should be inspected to the extent practical to detect damage in transit and to verify that the article and its acceptance data package are complete. An article should not be unpacked or subjected to the receiving inspection environment until a review has been made of the environmental requirements of the particular GFE to ensure that the integrity of previously accomplished inspection and cleaning procedures are maintained. Articles in moisture-proof or sealed containers should not be opened unless they are to be used immediately or show evidence of damage. Those containers which are opened and are found to contain serviceable articles should be represerved and repackaged if the articles are not to be used immediately.

Should there be evidence of damage in transit, the article should be inspected and/or functionally tested. This should be done regardless of whether or not the article was previously specified for inspection and/or test in receiving inspection. Articles damaged in transit which cannot be tested by the recipient due to lack of testing equipment or inadequate testing equipment should be returned.

The recipient should advise the cognizant Government quality representative and the Manned Spacecraft Center of any GFE found damaged, malfunctioning, or unsuitable for its intended use.

Receipt of GFE and accomplishment of receiving inspection functions, whether successful or not, should be recorded on the System and Component Historical Record, MSC form 772; Spacecraft Parts Tag, MSC form 911; or Explosive Device Historical Record, MSC form 380, whichever is applicable to the article.

3.2 BONDED STORAGE. Upon completion of receiving inspection, GFE should be forwarded to a bonded storage area which should provide for the identification and segregation of materials and equipment to indicate the current status of the article, such as "acceptable," "rejected," or

"awaiting test." The recipient should provide protection, periodic inspections, and controls to ensure that quality is maintained, that storage conditions are adequate, and that damage or deterioration does not occur in handling or storage. A list of all GFE equipment placed in the bonded storage area should be prepared and submitted to the Manned Spacecraft Center on a monthly basis or as otherwise specified in the contract. This list should be checked periodically by the recipient quality assurance organization to verify its adequacy and accuracy.

The bonded storage areas should be monitored by the recipient's quality assurance organization and all articles placed in or removed from bonded storage should be authorized by an approved work document and verified by the quality organization. A TPS (test preparation sheet), MSC form 1225 or equivalent document, should be utilized for authorizing removal from bond or work on GFE. The TPS or equivalent should provide engineering instructions, establish a method of work control, furnish historical records, and facilitate inspection under two categories as follows:

a. The type A TPS or equivalent is that category which authorizes work involving accomplishment or deletion of work or changes which permanently affect configuration of equipment.

b. The type B TPS or equivalent is that category which authorizes all other work and testing not involving configuration changes with the exception of work authorized by a discrepancy report/material review record (MSC form 2176) or equivalent document.

3.3 PROCESS, TEST, AND CONTAMINATION CONTROLS. GFE to be tested, installed, or otherwise utilized should be released from bonded storage only by approved TPS or equivalent document. GFE should not be diverted or loaned from its assigned purpose without prior approval of the Manned Spacecraft Center and an approved TPS or equivalent document. Functional GFE which was not functionally tested by the recipient upon receipt should be tested either prior to or after installation into the next level of assembly. Only those operations specifically authorized by documentation accompanying the GFE article should be performed without detail TPS or equivalent authorization. All testing, installation, and other operations involving GFE should be witnessed by the recipient quality assurance organization.

Modification and/or repair of GFE should be accomplished only after receipt of authorization from the Manned Spacecraft Center and should be implemented by approved TPS or equivalent document. Modification and/or repair should be accomplished under strictly controlled conditions by competent personnel utilizing approved processes and techniques. All modification and repair activity should be witnessed by the recipient quality assurance organization.

All test, assembly, installation, modification, and inspection operations should be controlled in accordance with documented cleanliness requirements for environments, work surfaces, tools, fixtures, handling, storage and shipping containers, and test and inspection equipment to prevent contamination degradation of GFE. Test or inspections should be performed to verify cleanliness prior to initial use and at established intervals during use to ensure continued cleanliness.

3.4 NONCONFORMANCE CONTROL. When an article does not conform to applicable drawings, specifications, or other requirements, it should be identified as nonconforming, segregated to the extent practical, and held for review action. Discrepant GFE should not be dispositioned, repaired, reworked, replaced, or in any way modified unless authorized by a TPS or equivalent or by the Manned Spacecraft Center.

The recipient of GFE should ensure that all GFE nonconformances are documented and that necessary corrective action is instituted when the cause has been determined to be in the recipient's operations and activities and such corrective action has been directed or approved for implementation by the Manned Spacecraft Center. A withhold tag (MSC form 1055) or equivalent should be immediately affixed to the article to withhold it from use when conditions are observed which are considered to be detrimental to or have an adverse effect on the operation or maintenance of the article, or the article exhibits malfunctions, physical damage, or deviation from approved documentation. The withhold tag should be removed by the quality assurance organization only when the discrepancy or unsatisfactory condition is eliminated and the integrity of the item is restored.

A DR/MRR (discrepancy report/material review record), MSC form 2176, or equivalent document should be used to record both equipment and procedural nonconformances which require engineering analysis, disposition, and documented corrective action. The recipient of GFE should conduct appropriate analyses and examinations of nonconforming articles or conditions to determine the cause or reason for the nonconformance.

The cognizant Government quality representative and the Manned Spacecraft Center should be notified of all discrepancies related to GFE and the results of analyses to determine the cause of the nonconformance. Disposition instructions should be requested from MSC.

3.5 DATA PACKAGE MAINTENANCE. Each article of GFE should be accompanied by a data package. The accumulated documentation and verified data provide a chronological history of the article's configuration and quality status and contains documentation necessary to identify, maintain, preserve, and utilize the article. The data package content is commensurate with the complexity of the article and may include documents and data such as:

- a. Drawings and specifications

- b. List of drawings and specifications
- c. Parts list
- d. Storage instructions
- e. Handling instructions
- f. Installation instructions
- g. Operating manuals or instructions
- h. Calibration instructions
- i. Operating time logs
- j. Limited life items lists
- k. Predelivery and preinstallation acceptance test and inspection data and procedures
- l. Waivers/deviations
- m. Shortage list
- n. Electrical connector bent pin log
- o. Electrical connector mate/demate log
- p. Material review records
- q. Certification of cleanliness
- r. Approved drawing change notices, engineering orders, etc.
- s. Open discrepancy reports
- t. Open failure reports
- u. Type A TPS's or equivalent
- v. Type B TPS's or equivalent used in lieu of formal test procedures
- w. HRE (hardware reuse evaluations) for previously flown articles
- x. Historical records (MSC forms 772, 911, or 380), as applicable
- y. Shipping documents (DD250, DD1149, MSC form 290, etc.)

z. Pressure vessel historical records

aa. Data package checklist

The content of the data package for class III equipment may be significantly less than for class I or II equipment, but will normally include at least items x and y above.

The recipient of GFE should maintain the data package received with the article. Activities related to GFE, such as receipt of the article, accomplishment of receiving inspection, placement in bonded storage, removal from bonded storage, testing, and installation should be recorded on the historical record associated with the article. Other information and data such as TPS's, authorized configuration changes, nonconformances, and operating time/cycles associated with the article should also be recorded in its historical record and copies of the appropriate documents should be included in the data package.

The recipient quality assurance organization should assure that the data package is complete and accurately maintained and should stamp all entries in the historical record.

Subsequent to the incorporation of a GFE article into a higher level of assembly, its data package should be included in the data package for the higher level of assembly.

3.6 SHIPPING CONTROL. The recipient quality assurance organization should perform necessary inspections to verify the quality status of all shipments, to ensure that such shipments are cleaned, preserved, packaged, packed, and marked in accordance with approved methods, and to ensure that the data package is included with the shipment.

Prior to signing the shipping document, the assigned quality assurance representative should review the applicable MSC forms 772, 911, or 380 to ensure that all blocks in the heading contain the proper entry or the statement "NA", that all statements in the historical events section of the MSC forms 772, 911, or 380 have been stamped by quality assurance, and that a copy of each document referenced on the MSC forms 772, 911, or 380 is included in the data package to be shipped. At the completion of the data package review, the following notation should be entered in the historical events section of the MSC form 772, 911, or 380: "DATA PACKAGE REVIEWED FOR COMPLETENESS."

The quality assurance representative should signify that the article and its data package are ready for shipment by signing the shipping document.

4.0 POINTS OF CONTACT

Recipients of GFE should contact the Manned Spacecraft Center Procurement Support Branch of the Quality Assurance Division, Code ND6, on any of the conditions cited in section 3 of this document requiring notification of the Manned Spacecraft Center. In addition, the resident NASA Manned Spacecraft Center representative or office or delegated Government agency should also be notified of those same conditions.

5.0 GLOSSARY

Article - A unit of hardware or any portion thereof.

Bonded Storage Area - Controlled access area used for storage and control of materials.

Deviation - A specific authorization, granted before the fact, to depart from a particular requirement of specifications or related documents.

Failure - The inability of an article to perform its required function under the specified conditions for the specified duration. All occurrences fitting this definition shall be considered failures even though the cause may be something other than an inherent article fault.

Government-Furnished Equipment (GFE) - Any article procured or produced by the Manned Spacecraft Center.

Hazardous Environment - Chamber environments such as vacuum, high temperature, low temperature, oxygen atmosphere, or any other environmental condition which could subject the user of the equipment to a hazard of any kind.

Limited Life Articles - Articles or materials which, due to environment, structural composition, or performance, are useful or function for specified time (hours, days, weeks, or years) and then require replacement to prevent failure in operation.

Manned Spacecraft Center - The NASA Manned Spacecraft Center, Houston, Texas, or resident NASA Manned Spacecraft Center representative or office.

Modification - Articles altered or reworked to incorporate design changes.

Recipient - Any contractor, other NASA center, other Government agency, or similar organization receiving GFE procured or produced by the Manned Spacecraft Center.

Repair - Restoration of defective material to an acceptable condition.

Significant Failure or Unsatisfactory Condition - Any failure or unsatisfactory condition which will adversely affect safety, contribute to schedule impact or launch delay, add significant cost, or which occurs during qualification testing.

Unsatisfactory Condition - Any major defect for which engineering disposition is required and which requires recurrence control beyond the specific article under consideration, a condition which cannot be corrected to the specified configuration using the standard planned operations, an event which could lead to a failed condition but does not affect the function of the article (i.e., contamination, corrosion, workmanship requiring engineering disposition, etc.).

Waiver - Granted use or acceptance of an article which does not meet specified requirements.